UPLAND VEGETATION

AFFECTED ENVIRONMENT & EVIRONMENTAL EFFECTS

Upland vegetation types surrounding Diamond Lake and along Lake Creek are dominated by coniferous montane forests heavily influenced by snowpack, geology, fire, soils and topographic relief. In general these forests are typical for elevations of 4,500-5,500 feet in the Southern Cascade Mountains. Four distinct forest types exist within the project, the most abundant being a lodgepole pine (*Pinus contorta*) dominated forest. Lodgepole pine forests occupy flat topography with soils that hold little moisture and have little organic matter. Repeated stand replacing fires can result in large tracts of land being dominated by lodgepole. The lack of a stand replacing fire would usually result in succession leading to a mountain hemlock/mixed fir dominated forest. These forest types are also more common along areas with some topographic relief especially with northeast to northwest aspects. Mountain hemlock (*Tsuga mertensiana*), Shasta red fir (*Abies magnifica var. shastensis*), white fir (*Abies concolor*), western white pine (*Pinus monticola)* and Douglas fir (*Pseudotsuga menziesii*) are the dominate tree species. A third type of forest is fairly limited and occurs in wet depressions and along the edge of wetlands. This vegetation type is dominated by Englemann spruce (*Picea englemannii*) and occurs along the banks of Lake Creek between Diamond Lake and Lemolo Lake. The fourth distinct forest type is dominated by Ponderosa pine (*Pinus ponderosa*) and is mostly confined to a relatively small area around the north end of Diamond Lake.

ENVIRONMENTAL EFFECTS

Direct and Indirect Effects:

<u>Alternatives 1, 2, 3, 4 and 5</u>
The scale at which direct and indirect effects are addressed is the project area boundary. A small amount of ground disturbance would occur as a result of re-constructing the canal on the north end if Alternative 2,3 or 5 is implemented; however, this low level of disturbance would not produce negative effects. No other ground disturbing activities are proposed that would have any direct or indirect effects on vegetation. The project would not lead to any negative direct or indirect effects with regards to upland vegetation.

Cumulative Effects:

<u>Alternatives 1, 2, 3, 4 and 5</u>

The scale at which cumulative effects are addressed is the 5th field watershed level. Many affects to the upland vegetation from past practices have occurred. Sheep grazing, telephone line installation, construction of campgrounds, road building, Lemolo 1 hydro project construction, construction of cabins, construction of the Dellenback trail, timber harvest, extensive road-building, stockman ignited fires and herbicide use for competition within timber plantations are some examples of actions that have impacted upland vegetation in the past within the vicinity of this project area. (see cumulative effects Table 9 for more detailed information). Fewer activities are currently impacting the upland vegetation environment and include hazard tree removal, fuel reduction projects, fire camp expansion, and herbicide and non-herbicide treatments of noxious weeds. (see cumulative effects Table 10). Foreseeable projects in the future that may impact the upland vegetation include hazard tree removal, Lemolo timber sales, fuels reduction projects and herbicide and non-herbicide treatments of noxious weeds (see cumulative effects Table 11.). Implementing any of the alternatives within this project is not likely to lead to any negative cumulative effects (when combined with the past, present and reasonably foreseeable actions) to upland vegetation because the scope of this project is focused on aquatic systems and does not propose any alteration of upland vegetation systems.

NOXIOUS WEEDS

No issues related to noxious weeds were identified in scoping.

AFFECTED ENVIRONMENT

Two non-native species were found to be occurring in the area that would be affected by this project. Reed canary grass (*Phalaris arundinaceae*) is not listed by the state or the Umpqua National Forest as a noxious weed, but it is a non-native species that can cause displacement of native plants, especially in wetlands and along stream and river corridors. Reed canary grass was found to be growing all around Diamond Lake and along Lake Creek all the way down to Lemolo Lake. This grass is fairly abundant where it is found and forms dense colonies that out compete or displace other vegetation.

Only one very common, nearly naturalized[1], state and forest listed noxious weed was found to be occurring within the project area. St. Johnswort (*Hypericum perforatum*) is a perennial forb introduced from Europe that has become well established on the Diamond Lake Ranger District. It is mostly distributed along roads, but is also known to occur in natural meadows and forests with less than 30% canopy closure. It was found in the open dry forested area along the southwest corner of the lake as well as in campgrounds and along many roads in the project area.

ENVIRONMENTAL EFFECTS

Direct and Indirect Effects:

Alternatives 1 & 4

The scale at which direct and indirect effects are addressed is the project area boundary for all alternatives. These alternatives would have no direct or indirect effects with regards to the spread of noxious weeds within the planning area. This is because these alternatives do not propose any activities that would spread any of the reed canary grass populations that ring the lake or occur along Lake Creek nor do they propose any activities that would spread or expand any of the St. Johnswort populations within the project area.

[1] Naturalized - an otherwise non-native plant that is so well established and has inundated so many different types of ecosystems that it is all but adapted to the new continent it was brought to.

Alternatives 2, 3 & 5

Both of these alternatives propose a draw down of the lake and construction related to reforming a canal that exits at the north side of Diamond Lake. These actions have the potential to increase the populations of reed canary grass around the lake and especially at the outlet of Lake Creek. It is not possible to know exactly what would occur due to these actions and it may be that this weedy species would not spread at all or possibly even decrease due to the extended drying that would occur around the edge of the lake as a result of the draw down. In most cases where heavy machinery works and disturbs ground, weeds expand to surrounding disturbed areas. The risk is moderate to likely that the reed canary grass problem would be exacerbated by implementing either of these alternatives. This risk is lessened by mitigation measures incorporated into Alternative 2 and 3, which require the re-vegetation of disturbed areas with native species, the education of work crews regarding this weed, and the washing of equipment to remove seed and plant parts to lessen the potential of spread.

Though not documented yet, a very important weed to keep out of the project area is purple loosestrife (*Lythrum salicaria*). Additionally, there are several aquatic weed species that could potentially be accidentally introduced into the lake during project work. Mitigation measures (included in Chapter 2) that require equipment washing, monitoring of the project area for any new invasive plants, and immediate action to control such invasions would help to reduce the likelihood of an infestation of purple loosestrife or other weeds occurring as a result of implementing Alternatives 2 and 3.

The mitigation measures and monitoring requirements established for the action alternatives respond to the standards and guidelines from the 2002 Forest Plan amendment for the Integrated Weed Management Strategy (Forest Plan Amendment #5).

Cumulative Effects:

Alternatives 1 & 4

The scale at which cumulative effects are addressed is the 5th field watershed level. Many effects with regards to the spread of noxious weeds from past practices have occurred. Sheep grazing, telephone line installation, construction of campgrounds, road building, Lemolo 1 hydro project construction, construction of cabins, construction of the Dellenback trail, timber harvest and extensive road building are some examples of actions that have led to a spread of noxious weeds in the past within this project area (Table 9). Fewer activities currently have the potential to spread noxious weeds but include hazard tree removal, fuel reduction projects and fire camp expansion. A positive ongoing activity for removing noxious weeds is the treating of spotted knapweed (*Centaurea beibersonii*) with herbicide along highway 138 (Table 10). Foreseeable projects in the future that may impact the spread of noxious weeds include hazard tree removal, Lemolo timber sales and fuels reduction projects (Table 11). The continued use of herbicide and various methods to control noxious weeds is a positive impact. Implementing either of these alternatives is not likely to lead to any negative cumulative effects (when combined with past, present or reasonably foreseeable actions) to noxious weeds as these alternatives do not propose ground disturbing activities or a lake draw down.

Alternatives 2, 3 & 5
Management activities that contribute to cumulative effects to noxious weeds are the same as described under Alternatives 1 and 4. Implementing either of these alternatives has the potential to further the spread of noxious weeds, especially reed canary grass. Disturbing the existing sites of reed canary grass, as these alternatives propose to do, has the potential to combine with past, present and potential future projects to lead to a overall likely increase of this species within the watershed. However, because the species is already well established throughout the project area, the consequences of this cumulative impact would be relatively minor.

Threatened, Endangered and Sensitive (TES) Plants

AFFECTED ENVIRONMENT

No Threatened or Endangered plants are known to occur on the Diamond Lake Ranger District and no habitat exists for any species listed as such. A complete Biological Evaluation (BE) disclosing affects to Regional listed Sensitive plants can be referenced in Appendix C. Also under the section on wetland plants and ecology there is a discussion about rare plants and their communities within the wetland ecosystems.

There are 61 species on the Regional Forester's Sensitive Plant list. Only one species, Kincaid's Lupine, is listed as Threatened throughout its range. This plant occurs in oak savannah habitat in the Willamette valley and is known from one isolated population on the Tiller Ranger District. There is no potential habitat for this plant within this planning area. Sensitive plants with potential habitat in the project area are displayed in Table 30. Former Survey and Manage (S&M) Species are covered in the "Former Survey and Manage Species" section below. All other sensitive species are listed in the botanical Biological Evaluation; no habitat exists for those species within the project area and they will not be discussed further.
All other sensitive species are listed in the botanical Biological Evaluation; no habitat exists for those species within the project area and they will not be discussed further.

Table 30. Sensitive species with potential habitat in the project area.

Latin Name	Common Name	Found During Surveys
Calamagrostis breweri Thurb.	Brewer's reedgrass	
Carex crawfordii Fern.	Crawford's sedge	
Carex serratodens W. Boott	twotooth sedge	
Scheuchzeria palustris ssp. americana L.	American scheuchzeria	X
Scirpus subtermanalis (Torr.) Sojak	water bulrush	X
Utricularia minor L.	lesser bladderwort	X
Wolffia columbiana Karst.	Columbian water-meal	
Wolffia borealis (Engelm. Ex Hegelm.) Landolt ex Landolt	northern water-meal	

& Wildi.		
Schistostega pennata (former S&M)	goblin's gold	**X**
Gyromitra californica (former S&M)	California elfin saddle	**X**

Potential habitats within the project area were surveyed during June and July of 2003. Potential habitat for sensitive plants was confined to wetlands along the south shore of Diamond Lake, along Lake Creek and along the south shore of Lemolo Lake. Three sensitive plants were found during field surveys.

American Scheuzeria was found in a fen[2] along Lake Creek just south of Highway 138. The population occurs over a three acre area within the fen.

Water bulrush was found growing on the margins of Teal and Horse Lakes as well as on the margins of shallow pools within the south shore wetland complex adjacent to Diamond Lake. Juvenile forms of the plant were also found in Diamond Lake along shallow margins at the south end of the lake. The condition of water bulrush with regard to population size, vigor and overall health is questionable. This is thought, though no quantitative data exists, to be a result of the previous 1954 draw down which likely affected this species' habitat negatively through drying of the wetland environment.

Lesser bladderwort was found growing in the south shore Diamond Lake wetland complex as well as the south shore Lemolo Lake wetland. The sites are very similar with plants occurring in areas with shallow standing water. The plant has small modified leaves that float on the surface of water and trap insects. Lesser bladderwort was found growing near the sites of water bulrush and likely suffered from the same negative effects due to the 1954 draw down and rotenone treatment.

[2] A fen is a wetland ecosystem in which the main source of water is usually nutrient rich groundwater.

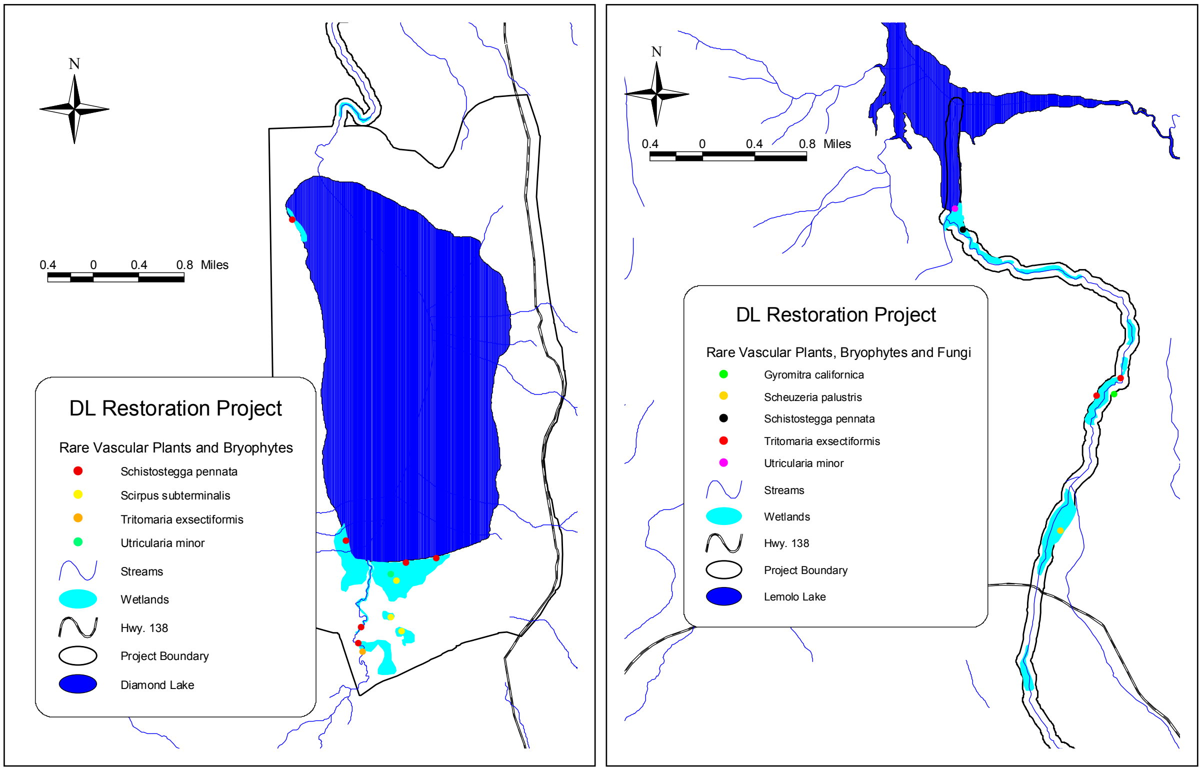

Figure 37. Rare plant sites within the project area.

ENVIRONMENTAL EFFECTS

American Schuezeria

Direct & Indirect Effects:

Alternative 1 & 4

Neither of these alternatives propose activities that would jeopardize this population of American Scheuzeria. This species is a wetland obligate species that is dependent on the fen ecosystem. These alternatives do not plan any alteration of that system; therefore, no direct or indirect effects would occur under these alternatives.

Alternatives 2, 3, & 5

None of the actions proposed in these alternatives would cause direct effects to this plant population. Indirect effects may occur if potential flooding and drying would occur in Lake Creek. However it is likely that this fen is dependent upon springs and groundwater (Hofford pers. com., 2003). It is unknown how much this fen depends on water from Lake Creek to keep it wet year round. If significant flooding or drying does occur there is potential for individual plants to be uprooted and washed downstream as well as for individual plants to desiccate. Neither of these scenarios would necessarily lead to extirpation of this population. Flooding is a natural occurrence and may actually help distribute the plant to new locations. Drying is not likely to affect this species or the fen, which is raised a little above the stream terrace. Therefore, no indirect effects are expected to occur. However there is minimal risk that negative effects could occur in a worse case scenario.

Cumulative Effects:

Alternative 1 & 4

The scale at which cumulative effects are addressed is the 5th field watershed level for all alternatives. The only past action that may have had affects on this population would be the 1954 lake draw down and subsequent drying of Lake Creek. This is only speculative, however, and the population seems to be fully recovered, if any negative effects did indeed occur (see Table 9 for past management activities). The only current ongoing activity that may be affecting this population is the water rights that change flow of Lake Creek from natural historic flows (Table 10). The influence of this water manipulation has obviously not been enough to negatively impact this population to date. Under these two alternatives no future foreseeable projects would have any affects on this population of American Scheuzeria (Table 11). When combined with the past, present and reasonably foreseeable projects, implementing either of these alternatives is not likely to lead to any negative cumulative effects to this population of American Scheuzeria, which is the only known population within the entire Umpqua basin.

Alternatives 2, 3, & 5

The past, present and reasonably foreseeable actions contributing to cumulative effects are the same as those described under Alternatives 1 and 4. For Alternatives 2, 3, and 5, there is minimal risk that this project would have any affects on this population of American Scheuzeria. When combined with the past, present, and reasonably foreseeable actions (Tables 9-11), implementing these alternatives is not likely to lead to any negative cumulative effects to this population of American Scheuzeria.

Water bulrush

Direct and Indirect Effects:

Alternatives 1 & 4

Neither of these alternatives proposes activities that would jeopardize these populations of water bulrush. This species is a wetland obligate species that is dependent on lake margins and fen ecosystems with areas of shallow water. These alternatives do not plan any alteration of these systems; therefore, no direct or indirect effects would occur under these alternatives.

Alternatives 2, 3, & 5

No direct effects to water bulrush are expected to occur as a result of implementing either of these alternatives. Indirect effects are likely to occur as a result of lowering Diamond Lake and drying the margins of the lake, the sedge meadow/fen systems along the south shore, and the potential drying of Teal Lake (Breeden pers. com., 2003, Kemmers and Jansen, 1988, Beltman et. al. 2001). This would almost certainly lead to some desiccation of plants from the drying of their habitat. Whether these effects would be long term is unknown, but it is anticipated that the water bulrush would likely return within five years.

Cumulative Effects:

Alternatives 1 & 4

The scale at which cumulative effects are addressed is the 5th field watershed level for all alternatives. Past actions that may have had affects on this plant would be the 1954 draw down and water rights which affect the levels and margins of Diamond Lake (Table 9). The only current ongoing activity that may be affecting this population is the water rights that continue to impact the lake margins of Diamond Lake (Table 10). The influence of this water manipulation has possibly caused populations of water bulrush to stay in a juvenile state, potentially halting reproduction. By keeping the water at a steady high level, the margin of Diamond Lake has not naturally receded, an event which would open habitat for this species. Under these two alternatives, the only future foreseeable action that would have affects on this plant would be maintaining the water rights (Table 11). When combined with the past, present, and reasonably foreseeable effects, implementing either of these alternatives is not likely to lead to any negative cumulative effects to this population of water bulrush.

Alternatives 2, 3, & 5

The past, present and reasonably foreseeable actions contributing to cumulative effects are the same as those described under Alternatives 1 and 4. Under Alternatives 2, 3, and 5, future foreseeable actions that would have affects on this plant would be implementing either of these alternatives and maintaining the water rights (Table 11). When combined with the past, present, and reasonably foreseeable actions (Tables 9-11), implementing any of these alternatives is likely to lead to negative cumulative effects to this population of water bulrush. This is because the extended drying of the plants habitat proposed with these alternatives, as well as the 1954 treatment and the manipulation of lake water levels are affects that have and would continue to negatively impact this sensitive plant by drying its habitat. This effect would lead to some loss of individual plants and may compromise reproductive ability of the species. It is anticipated however, that these plant populations would recover relatively soon because the period of plant desiccation would not occur any longer than one season.

Lesser bladderwort

Direct and Indirect Effects:

Alternatives 1 & 4

Neither of these alternatives propose activities that would jeopardize these populations of lesser bladderwort. This species is a wetland obligate species that is dependent on sedge meadow/fen ecosystems with areas of shallow water. These alternatives do not plan any alteration of these systems; therefore, no direct or indirect effects would occur under these alternatives.

Alternatives 2, 3, & 5

No direct effects are expected to occur as a result of implementing Alternatives 2, 3, or 5. Indirect effects are likely to occur as a result of lowering Diamond Lake and drying the sedge meadow/fen ecosystems along the south shore of Diamond Lake (Breeden, 2003, Kemmers and Jansen, 1988, Beltman et. al. 2001). Desiccation is expected in some plants as a result of prolonged drying of the habitat. Whether these effects will be long term is unknown, but it is anticipated that the lesser bladderwort would likely return in a relatively short amount of time.

Cumulative Effects:

Alternatives 1 & 4

The scale at which cumulative effects are addressed is the 5th field watershed level for all alternatives. Past actions that may have had affects on this plant would be the 1954 draw down Diamond Lake and the implementation of Lemolo 1 hydropower projects (Table 9). The only current ongoing activity that may be affecting this population is the Lemolo 1 hydropower projects which fluctuates water at Lemolo Lake. These actions have not resulted in the complete extirpation of this species from the area, but they have likely significantly reduced the amount of habitat (see Table 10 for present management activities). Under these two alternatives the only future foreseeable action that would have affects on this plant would be the continued operation of the Lemolo 1 hydro project (Table 11). When combined with the past, present, and reasonably foreseeable effects, implementing either of these alternatives is not likely to lead to any negative cumulative effects to these populations of lesser bladderwort since no alteration of the aquatic systems would occur.

Alternatives 2, 3, & 5

The past, present and reasonably foreseeable actions contributing to cumulative effects are the same as those described under Alternatives 1 and 4. When combined with the past, present, and reasonably foreseeable actions, implementing either Alternatives 2, 3, or 5 would likely to lead to negative cumulative effects to some of the populations of lesser bladderwort due to the potential of prolonged drying of their habitat. It is likely that the 1954 draw down combined with the proposed draw down would cause drying and desiccation to lesser bladderwort populations on the south shore of Diamond Lake. A loss of individual plants is expected and there may be a loss of vigor within the entire population along the south shore, which already seems to be only barely holding on. The populations at the south end of Lemolo Lake would likely not be impacted by these alternatives.

FORMER SURVEY AND MANAGE SPECIES

AFFECTED ENVIRONMENT

Rare Bryophytes, Fungi, and Lichens were recently added to the Regional Sensitive Species List (USDA Forest Service 2004). Prior to their inclusion on the list they were listed as Survey and Manage Species. On April 21, 2004, Survey and Manage Mitigation Measure Standards and Guidelines were removed from the Pacific Northwest Forest Plan. The Record of Decision (ROD) was signed on March 22 (USDA Forest Service and USDI Bureau of Land Management 2004a). The following is a description of how the decision affects projects, such as this, with surveys already started or completed (USDA Forest Service and USDI Bureau of Land Management 2004a):

"Surveys may have already been completed for individual projects. No additional survey work is required for projects that have fully complied with the current Survey and Manage Mitigation Measure Standards and Guidelines and existing Special Status Species Policies. Known sites of species formerly included in Survey and Manage that are included in the Special Status Species Programs will be managed under Special Status Species Policies. Known sites of Survey and Manage species not included in Special Status Species Programs will be released for other management uses after the effective date of this Record of Decision.

Surveys may have already been completed for individual projects. No additional survey work is required for projects that have fully complied with the current Survey and Manage Mitigation Measure Standards and Guidelines and existing Special Status Species Policies. Known sites of species formerly included in Survey and Manage that are included in the Special Status Species Programs will be managed under Special Status Species Policies. Known sites of Survey and Manage species not included in Special Status Species Programs will be released for other management uses after the effective date of this Record of Decision."

Surveys to protocol for Survey and Manage flora requiring pre-habitat disturbing activities were conducted during the summer of 2003. Three rare Survey and Manage species were discovered within the project area during surveys; two rare bryophytes adapted to wetland conditions that persist around Diamond Lake and along Silent Creek and Lake Creek, and one fungus that seems to prefer wetland meadow edges.

Goblin's gold (*Schistostega pennata*) (Figure 38) was a Survey and Manage category "A" moss requiring management of all known sites. It is now a Forest Service Sensitive Species for Oregon and Washington. Three sites are known on the Umpqua National Forest, two of which occur within this project area. The population along Silent Creek is the southern most known site on the west coast of North America. This species grows on the underside of rootwads of lodgepole pine that have tipped over in the wet unstable soils along Diamond Lake and in other wet meadows adjacent to Silent Creek and Lake Creek. The substrate and ecological niche this moss is adapted to is fairly specific and rare across the landscape. The management recommendations for this species state that maintaining micro-climatic conditions and leaving rootwads intact are necessary for the persistence of the moss.

Figure 38. Goblin's gold moss.

Little brownwort (*Tritomaria exsectiformis*) was a Survey and Manage category "B" liverwort requiring management of all known sites. It was not added to the Forest Service Sensitive Species list in July 2004. The Oregon Natural Heritage Program considers little brownwort a rare plant in Oregon. Although it is not on the Sensitive Species list, the Umpqua National Forest continues to manage it as such. Of the seventeen known sites of this species, five occur on the Umpqua National Forest; two are within this project area. This species forms tiny leafy mats on moist to wet decaying logs that have fallen from the edge of fens[3] and are being decomposed slowly in the fen environment. It also can be found on hummocks of sphagnum[4] on the edge of slow moving streams. This unique wetland environment is fairly rare across the landscape, hence the rareness of this species. No official management recommendations exist for this species. Draft recommendations state that maintaining micro-climatic conditions and maintaining the integrity of substrate are essential with regard to persistence of sites.

Figure 39. California elfin saddle.

California elfin saddle *(Gyromitra californica)* (Figure 39) was a Survey and Manage category "B" fungus. It is now a Forest Service Sensitive Species for Oregon and Washington. This species has only been found in two locations (including this site) on the Umpqua National Forest and is known from 33 sites in the Pacific Northwest. It seems to prefer edges of wet meadows, at least on the Umpqua National Forest. This species is not covered under the "Management Recommendations for Survey and Manage Fungi" (September, 1997) and there is no other known source to reference for this information. This species is a decomposer, so it is important to keep downed wood moist and intact where the fungus was found growing.

ENVIRONMENTAL EFFECTS

<u>Goblin's gold</u>

Direct and Indirect Effects:

<u>Alternatives 1 & 4</u>
These alternatives do not propose any draw down of Diamond Lake or associated affects to Lake Creek. The habitat for this moss depends solely on these hydrologic systems and the

[3]Fens are a wetland ecosystem in which the main source of water is usually nutrient rich groundwater.
[4]Sphagnum is a general term for moss forming peat mounds.

humidity and habitat they create. These alternatives do not propose to alter any of these systems and would lead to no direct or indirect effects to goblin's gold.

Alternatives 2, 3 & 5

No direct effects are expected to occur as a result of implementing these alternatives. Indirect effects are likely to occur as a result of lowering Diamond Lake and drying the margins of the lake and the sedge meadow/fen systems along the south shore (Breeden, 2003, Kemmers and Jansen, 1988, Beltman et al. 2001). Species of moist habitats (e.g. *Schistostega pennata*) are always killed by even slight drying (Proctor 1982). According to Regional Bryophyte Taxa Expert, Judy Harpel Ph.D., it is likely that *S. pennata* would return to the south shore sites as long as the populations along Silent and Lake Creeks remain as dispersal sources for future re-colonization (Harpel pers. Comm., 2003).

Therefore, with mitigation, there is a minimal risk that it would be extirpated from the south shore wetlands and populations would continue to persist along Silent Creek, Lake Creek, and near Lemolo Lake, as well as other populations outside of this project in the Kelsay Valley.

Cumulative Effects:

Alternatives 1 & 4

The scale at which cumulative effects are addressed is the 5th field watershed level for all alternatives. Past actions that may have had effects on this moss would be the 1954 lake draw down and water rights which affect the levels and margins of Diamond Lake (Table 9). The only current ongoing activity that may be affecting this population is the water rights that continue to impact the lake level of Diamond Lake (Table 10). This action may actually be a positive effect to this moss because it keeps the habitat wet for longer each year, which seems to be necessary for the moss to persist. Under these two alternatives the only future foreseeable action that would have affects on this plant would be maintaining the water rights (Table 11). Implementing either of these alternatives would not lead to any negative cumulative effects to goblins gold, since no lake manipulation activities would occur.

Alternatives 2, 3 & 5

The past, present and future actions that contribute to cumulative effects would be the same as described under Alternatives 1 and 4 for this species. Implementing Alternatives 2, 3, and 5 may lead to negative cumulative effects, when combined with the past, present, and reasonably foreseeable effects, as continued drying from the lake draw down may impact the habitat for this species. However, it is thought that these populations would re-establish after a few years, as long as there is a source for re-colonization (Harpel pers. com., 2003). The populations up Silent Creek would not be impacted and would provide a source for dispersal and re-colonization. In addition, mitigations detailed in Chapter 2, that require supplying water to about a third of the population, would facilitate maintenance of a portion of the affected individuals throughout the draw period and would promote re-colonization.

Little brownwort

Direct and Indirect Effects:

Alternatives 1 & 4

These alternatives do not propose any draw down of Diamond Lake or associated affects to Lake Creek. The habitats for this liverwort depend solely on these hydrologic systems and the humidity and habitat they create. These alternatives do not propose to alter any of these systems and would lead to no direct or indirect effects to little brownwort.

Alternatives 2, 3 & 5
No direct effects are expected to occur as a result of implementing either of these alternatives. There is potential for indirect effects to occur if Lake Creek floods or dries significantly enough to dry out the areas where the liverwort is growing. There is minimal risk that this would occur and even if it did there are several sites far enough away from Lake Creek that don't seem to be under any influence from the creek and would continue to persist. These sites would serve as dispersal populations should some of the little brownwort sites be impacted by the project. The proposed effects to this liverworts habitat would be temporary. No long term impacts to habitat conditions are anticipated.

Cumulative Effects:

Alternatives 1 & 4
The scale at which cumulative effects are addressed is the 5^{th} field watershed level for all alternatives. Past actions that may have had affects on this liverwort would be the 1954 lake draw down which may have affected Lake Creek (Table 9). No current activities are affecting the populations of this species (Table 10). Under these two alternatives there are no future foreseeable projects that would affect this species (Table 11). Implementing either of these alternatives would not produce any negative cumulative effects, when combined with past, present or reasonably foreseeable actions for little brownwort.

Alternatives 2, 3 & 5
The past, present and future actions that contribute to cumulative effects would be the same as described under alternatives 1 and 4 for this species. Implementing these alternatives may lead to negative cumulative effects when combined with past, present, and reasonably foreseeable effects described for little brownwort. However, there is minimal risk that negative cumulative effects would occur and it is anticipated that it would take a one hundred year flood or severe drying much worse than expected to produce those effects. If these kinds of events do take place, several sites far enough away from Lake Creek would remain and would not be impacted by the project. These sites would serve as dispersal populations if some of the little brownwort sites were impacted.

California elfin saddle

Direct and Indirect Effects:

Alternatives 1 & 4
These alternatives do not propose any draw down of Diamond Lake or associated affects to Lake Creek. The habitats for this fungus depend on these hydrologic systems and the

humidity and habitat they create. These alternatives do not propose to alter any of these systems and would lead to no direct or indirect effects to California elfin saddle.

Alternatives 2, 3 & 5
No direct effects are expected to occur as a result of implementing these alternatives. There is potential for indirect effects to occur if Lake Creek floods or dries significantly enough to dry out the areas where the fungus is growing. There is minimal risk that this would occur (Hofford pers. com., 2003). With the minimal risk present, it is likely that no indirect effects would occur to this fungus.

Cumulative Effects:

Alternatives 1 & 4
The scale at which cumulative effects are addressed is the 5th field watershed level for all alternatives. Past actions that may have had affects on this fungus would be the 1954 lake draw down which may have affected Lake Creek (Table 9). No current activities are affecting the populations of this species (Table 10). Under these two alternatives there are no future foreseeable projects that would affect this species (Table 11). Implementing either of these alternatives is not likely to lead to any negative cumulative effects when combined with past, present, and reasonably foreseeable actions described for California elfin saddle.

Alternatives 2, 3 & 5
The past, present and future actions that contribute to cumulative effects would be the same as described under alternatives 1 and 4 for this species. Implementing either of these alternatives may lead to negative cumulative effects when combined with the past, present, and reasonably foreseeable actions for California elfin saddle. There is minimal risk that negative effects would occur and it would take a one hundred year flood or severe drying much worse than anticipated to produce those effects. However, if this site is extirpated it is the only known site in the watershed and would produce significant cumulative effects at this scale. There is one other known site in the Fish Creek Desert area, 13 miles to the west. However, with the minimal risk associated with these alternatives, it is anticipated that no cumulative effects would occur.

WETLAND PLANT ECOLOGY

AFFECTED ENVIRONMENT

Approximately 300 acres of wetlands occur within the project area (Figure 40). Roughly 140 acres of wetlands border the south shore of Diamond Lake. About 100 acres occur sporadically as small fens and riparian influenced areas along Lake Creek between Diamond Lake and Lemolo Lake. Another fairly large wetland complex borders Lemolo Lake near the mouth of Lake Creek. An emergent wetland area roughly 6 acres in size occurs along the northwest edge of Diamond Lake.

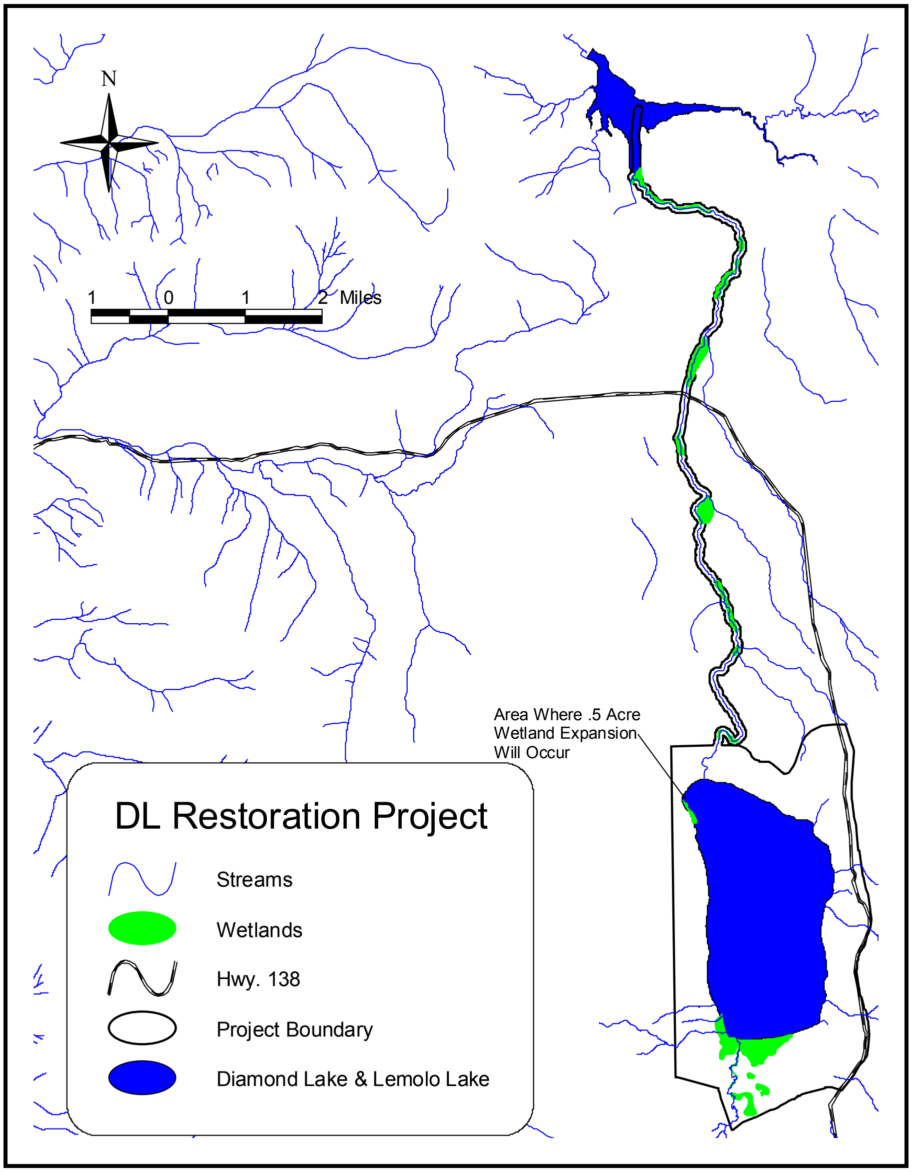

Figure 40. Wetlands Within the Project Area.

An additional 0.6 acres of wetlands would be constructed in this area and planted with emergent wetland species under three action alternatives. A description of appropriate plants for use in wetland establishment is included in the Botany Report in Appendix C of the FEIS.

Existing wetlands in the project area are classified mostly as "poor fens" or "transitional wetlands" (Crum, 1988; Mitch & Gosselink, 1993; McNamara et al., 1992; Boeye et al., 1995) because of the presence of standing water with abundant sedges and grasses along with some areas being dominated by various moss species and *Sphagnum spp*. These are systems that are in a successional state between being a minerotrophic[5] fen and an ombrotrophic[6] bog, a process that is occurring over thousands of years.

Some areas are in a more minerotrophic stage while some specific areas appear to be advancing more towards an ombrotrophic state. Subtle changes in plant species can be seen that indicate different pH and nutrient levels correlating with the different stages leading to a bog condition. Plants from the Heath family (*Ericaceae*) such as bog laurel and bog blueberry are tolerant of the more acidic conditions persisting within the more ombrotrophic peat bog areas (Crum, 1988, Beltman et. al., 1996, Boeye et al., 1994).

The plant communities dependent on these wetland systems are fairly uncommon on the Umpqua National Forest and are habitat for two vascular plants, one bryophyte, and a fungus listed as Sensitive, and a former Survey and Manage bryophyte. All these species were described previously in the TES Plants section.

South Shore Diamond Lake Wetlands

The largest expanse of wetland ecosystems occur on the south shore of Diamond Lake. These wetlands seem to fit the classification of sedge meadows more than that of a fen system (Crum, 1988). However, certain areas within these meadows are showing more of a rich fen type system, as can be attested to by the presence of certain species of peat moss, which are rich fen indicator species. Sedge meadows are similar to marshes, but tend to be a bit drier during the summer months and can tolerate more drying in general. The fen ecosystem differs in that there is a constant supply of water rich in minerals (especially calcium) and by accumulating significant peat. Closer to Silent Creek the sedge meadow wetland gives way to a more classic type of a minerotrophic fen with a higher diversity of forbs. While forb abundance and diversity seem low in the south shore wetland, sedge diversity and especially abundance are fairly high. Table 31 lists the plant species that were found during field surveys in the summer of 2003.

Table 31. Plant Species Occurring in the South Shore Diamond Lake Wetland Complex.

Scientific Name	Common Name
VASCULAR PLANTS	
Carex aquatilis	water sedge
Carex canescens	silvery sedge
Carex echinata	star sedge
Carex utriculata	beaked sedge
Carex simulate	analogue sedge
Cicuta douglasii	western water hemlock
Comarum palustris	purple marshlocks
Drosera anglica	English sundew

[5]Minerotrophic fen- wetland ecosystems rich in nutrients deriving nutrients and water from precipitation and groundwater. Usually with a higher more basic pH.
[6]Ombrotrophic bog- wetland ecosystem that derives nutrients and water solely from the atmosphere because of the large amount of peat accumulation creating an impermeable barrier from groundwater. Usually with a very low acidic pH.

Scientific Name	Common Name
Eleocharis quinqueflora	fewflower spikerush
Eriophorum gracile	slender cottongrass
Juncus sp.	Rush
Nuphar lutea ssp. polysepala	Rocky Mountain pond lily
Pedicularis groendlandica	elephants head
Pinus contorta var. latifolia	lodgepole pine
Potamogeton gramineus.	Pondweed
Salix sp.	willow
Scirpus subterminalis	water bulrush
Sparganium natans	small bur-reed
Spiranthes romanzoffiana	hooded ladies'-tresses
Utricularia minor	lesser bladderwort
Vaccinium uliginosum	bog blueberry
MOSSES	
Aulocomnium palustre	ribbed bog moss
Drepanocladus sp.	
Schistostega pennata	goblins gold
Sphagnum subsecundum	peat moss

Much of the wetlands are covered by sedges of one species or another. Figure 41(left) shows a band (light beige color) of star sedge surrounded by the most common and abundant sedge in the wetlands, beaked sedge. In areas where water is standing, other communities have begun to develop and yellow pond lily is usually present floating on the surface. In the more shallow waters on the margins of standing water, lesser bladderwort and water bulrush were found.

Figure 41. South shore wetland complex at Diamond Lake (left) and cottongrass (right) growing within a meadow complex.

Figure 41 (right) shows slender cottongrass (the white cottony looking plant in the background) and its habit of forming nearly pure stands in certain areas of the wetland. The other plant in this picture is fewflower spikerush and can be seen on the left side of the photo having small brown spike like inflorescences. An interesting aspect to the communities in these wetlands is how different plant species seem to take over and dominate given areas. Very few species were found to be occurring throughout the wetland in every distinct community.

The dependence of these wetlands on lake levels of Diamond Lake and groundwater discharge and recharge is imperative in understanding how these ecosystems have developed and are maintained. Groundwater studies show that these underwater aquifers play important roles in feeding water to Diamond Lake and the wetlands around the lake (Breeden pers. com., 2003).

Wetlands Along Lake Creek and Lemolo Lake

The wetlands along Lake Creek consist of more typical minerotrophic and transitional fens as well as riparian wetlands and floodplains (Crum, 1988; McNamara et al., 1992). In some of these wetlands, much more peat and bog-type conditions exist as opposed to the wetlands on the south shore of Diamond Lake. A much more diverse array of forb species were documented in these areas. It appears that more mineral rich springs and underground water sources are feeding the wetlands along Lake Creek. The wetlands on the south shore of Lemolo Lake are more similar to those along Diamond Lake, but there is much more diversity in shrub and forb species. Figure 42 shows some of the diverse shrub and forb communities in these areas.

Figure 42. Wetland complex bordering Lemolo Lake illustrates the abundance of Bog Birch.

Shrub species such as bog birch and sitka alder dominate some areas, while diverse forb communities with species like slender cottongrass, hairy arnica, streamside groundsel and Columbian monkshood are interspersed throughout the wetlands.

ENVIRONMENTAL EFFECTS

The draw down of Diamond Lake along with potential flooding and then drying of Lake Creek are the actions in this project which may have impacts on the wetland ecosystems in the project area. No other direct, indirect or any other connected actions proposed would have any effects.

Direct and Indirect Effects:

<u>Alternatives 1 & 4</u>
The scale at which direct and indirect effects are addressed is the project area boundary for all alternatives. These alternatives do not require draining of Diamond Lake and the associated actions necessary to perform the draw down. Alternative 1 does nothing, basically leaving the existing condition as status quo. No adverse effects are currently known to be occurring to the wetland ecosystems. Though the water quality and recreational opportunities at the lake are being negatively affected, there has not been any correlation made that this would eventually affect the wetland ecosystems. Implementing either of these alternatives is expected to have no direct or indirect impacts on the wetland environment or the rare plant species dependent on those environments.

<u>Alternatives 2, 3 & 5</u>
Direct Effects: All of these alternatives propose an eight foot draw down of Diamond Lake. The change in water table and groundwater recharge expected from this action has the potential to temporarily dewater the south shore wetlands (Breeden pers. com., 2003). Dewatering the south shore wetland would result in some short term negative effects, in that some individual plants may dry and desiccate. Some of the species identified from the area are rhizomatous and are expected to recover from one season of drying. There is minimal risk that the draw down would result in permanent changes to the wetland environment on the south shore of Diamond Lake. There is some uncertainty as to whether the wetlands would incur any permanent changes, potentially changing the rare plant communities that are adapted to them. However, based on professional judgment and the low likelihood of permanent impacts, there is minimal risk that this would occur.

These alternatives also propose to raise the level of Lake Creek to bank full level while Diamond Lake is being drained and then lower the level of Lake Creek to nearly no flow after the eight foot draw down is completed. Most of the wetlands along Lake Creek are fed by localized springs and groundwater. However, there are some uncertainties about raising the creek to bank full during the fall and winter months because of the potential for severe flooding should a large rain or rain on snow event occur. The affects that severe flooding could have on the fen ecosystems adjacent to Lake Creek are unknown. Flooding is a natural disturbance and is within the historic range of variability for the area. But the flooding that may occur would most likely be exacerbated by the actions implemented from these alternatives. Flooding could also lead to positive effects due to increasing diversity of the fens allowing for new species to colonize, or it could lead to negative effects by allowing noxious weeds such as reed canary grass to colonize new areas. Although uncertainty exists, the risk is fairly minimal that negative effects to the fen vegetation would occur over the long term.

The lack of water in the Lake Creek channel after the draw down is complete also has potential to produce negative effects on these ecosystems. Lake Creek is expected to be fairly dry from the outlet at Diamond Lake down to the inlet of Thielsen Creek into Lake Creek (Hofford pers. com., 2003). See Figure 43 for details of where this would potentially occur.

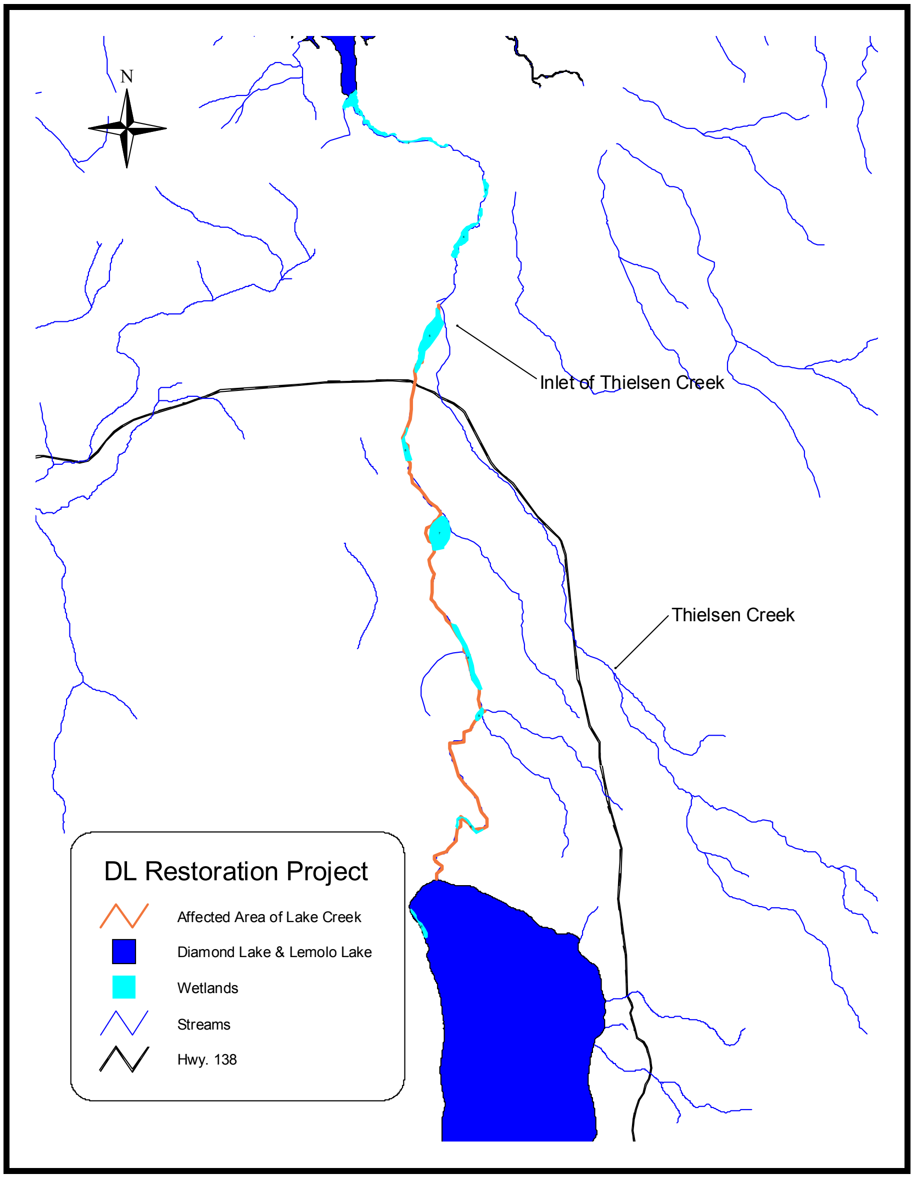

Figure 43. Map Showing Affected Area of Lake Creek From Drying After Draw Down Is Complete.

Most of the fen systems along Lake Creek are supported by localized springs and groundwater that would not be impacted by the draw down. There is uncertainty as to how much the water from Lake Creek affects these fen ecosystems and what would happen when that water is not available for an entire season. Literature does exist stating that manipulating hydrology in given catchment areas can have affects on certain types of minerotrophic fens (Kemmers and Jansen, 1988; Boeye et al., 1995; Beltman et al., 2001). However, it is not possible to say what the specific outcome of this temporary impact would be. It is anticipated that a moderate risk of direct negative effects to these fen ecosystems may occur over the short term as a result of the prolonged lack of water in Lake Creek under Alternatives 2, 3, and 5.

Indirect Effects: The scale at which indirect effects are addressed is the project area boundary. The effects to hydrochemistry could play a role in what happens to the vegetation in these wetlands (Kemmers and Jensen, 1988). No data is available on the hydrochemistry of the wetlands so it is not possible to assess risk with regards to hydrochemistry. The proposal does not involve any changes in chemistry to Diamond Lake besides adding rotenone, which does not affect plants and would not change the hydrochemistry of the wetlands over the long term. From assessing the vegetation, it appears some areas are high in acidic components as these areas support species tolerant of those chemicals. Other areas appear to be high in various nutrients, especially phosphorous (Johnston pers. com., 2003). Minimal risk of long term changes to the plant communities from hydrochemistry alteration is likely.

The only other potential indirect effect includes the potential for noxious weeds to enter the wetlands. These effects were described previously.

Cumulative Effects:

Alternatives 1 & 4

Many effects to the wetlands from past practices have occurred, and have been described previously (Table 9). Some activities have had minor affects, while others have likely contributed to some severe changes in these ecosystems. For instance, the affects of recreation has probably had little impact with campers and hikers periodically trampling vegetation while the affects of road building directly impacted the wetlands with heavy machinery. The previous rotenone treatment and draw down probably caused some decline in species diversity and may have changed some of the composition of the south shore wetland complex. There is no way to be certain but with the potential for sustained drying under Alternatives 2 and 3 it can be assumed that there was also sustained drying 50 years ago. Sustained drying in wetlands can, and has in other cases, led to lower species richness (Kemmers et. al., 1988). Unfortunately, no quantitative or qualitative data from that era exists that describes the past effects. Fewer activities are currently impacting the wetland environments, but include hazard tree removal, Lemolo 1 hydro project implementation, recreation use and water rights use (Table 10). In particular, existing water rights may be significantly affecting the south shore Diamond Lake by not allowing the natural seasonal fluctuations of water on the lakes margins. This may be having the affect of eliminating certain species that would otherwise be emergent colonizers of the lake's edge. Foreseeable projects in the future that may impact the wetland environment include hazard tree removal, continued use of water rights, continued heavy recreation use and the Lemolo 1 hydro project

(Table 11). The implementation of Alternatives 1 or 4 would not further contribute to cumulative effects, because neither alternative proposes a lake draw down.

Alternatives 2, 3 & 5

The scale at which cumulative effects are addressed is the 5th field watershed level. Many effects to the wetlands from past and present practices have occurred and were described under Alternatives 1 and 4. They are the same for these alternatives. Implementing Alternative 2, 3, or 5 of this project would likely contribute to negative cumulative effects to the wetland environments in the project area, especially those along the south shore of Diamond Lake. This is because the combined effects of the previous rotenone treatment and other past actions along with the proposed actions from Alternative 2, 3, or 5 would lead to an overall negative effect through drying, desiccation and simplification of species richness. However, it is expected that only short term negative effects would occur. There is minimal to moderate risk that long term negative cumulative effects would occur.

SUMMARY OF EFFECTS TO WETLAND PLANTS

Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
Short Term	***Long Term***	***Short Term***	***Long Term***	***Short Term***	***Long Term***	***Short Term***	***Long Term***	***Short Term***	***Long Term***
No Effect	No Effect	Likely Negative Effects	Minimal Risk of Effects	Likely Negative. Effects	Minimal Risk of Effects	No Effect	No Effect	Likely Negative. Effects	Minimal Risk of Effects

Table 32 summarizes the expected effects of project alternatives on rare plant communities within wetland ecosystems across the project area - including Diamond Lake shoreline, Silent Creek, and Lake Creek wetlands. Acres of wetlands that would be temporarily dewatered under Alternatives 2, 3, and 5 were described and summarized in the Groundwater section of this document.

Table 32. Summary of effects of each alternative to rare plant communities in wetland ecosytems in the Diamond Lake project area.

Planting Prescription for NW Diamond Lake Wetland Expansion

An area roughly .5 acres in size will be filled with 900 cubic yards of sediment fill as the canal is constructed in Diamond Lake. In this area it is possible to mitigate for negative effects to wetlands that would occur as a result of a lake draw-down by enhancing the ecosystem through wetland expansion. Three vital aspects of wetland creation include hydrology, soil and flora. This prescription for planting seeks to capture the need to establish wetland vegetation in the area to ensure the integrity of the developing ecosystem. Thorough and thoughtful planning is important in meeting this need. Plant seed, cuttings and transplants would need to be collected well ahead of time to establish in a forest service nursery in order to increase the likelihood of successful out-planting. The following table lists those plants that should be used in this effort:

Species	Common Name	# of plants	Cost/plant	Total Cost
Scirpus acutus	hardstem bulrush	3000	.60	$1650

Carex vesicaria	inflated sedge	3000	.60	$1650
Typha latifolia	cat tail	1000	.60	$550
Eleocharis palustris	common spike-rush	2000	.60	$1100
Totals		**9000**		**$5400**

This plant list represents obligate emergent macrophytes that are already growing in the adjacent NW Diamond Lake wetland. The spacing would be roughly one plant for every two square feet. Other floating macrophytes may also be considered in the future. This prescription could change depending on the exact engineering that occurs to establish the 900 cubic yards of sediment. This planting prescription assumes depths of water to be planted into to be from 1 to 3 feet. The exact time and methods for planting will be determined as the project progresses. Seed collection should begin in the summer and early fall of 2004 to ensure the nursery has enough time to propagate the 9000 plants as container plugs. In the table, $.15 per plant is added to the cost for seed collection. It is expected that it would take one person 18 days to plant the entire area with 9000 plants. This roughly equates to a cost of $2700 for the labor involved in out-planting. That leaves the total cost of the vegetation portion of this wetland expansion at **$8100**.

Botany Mitigation/Monitoring

Native Plant Revegetation
Terrestrial areas that would be impacted by canal construction and other miscellaneous activities should be re-vegetated in accordance with Umpqua National Forest policy, using only local native plant species. Site specific planting prescriptions would be prepared by the District Botanist and plants and seed would be made available as deemed necessary. This responds to the 2002 Integrated Weed Management Strategy Forest Plan Amendment.

Monitoring of Wetlands
In order to assess the impacts of the drawdown on the wetland vegetation at the south shore of Diamond Lake and other sites to be determined in the future, it is recommended that a vegetation monitoring protocol be established prior to and during implementation and for 5 years after the project is completed. This information can then be used to assist in the development of future projects that may impact wetland systems.

Mitigation/Monitoring for Goblins Gold
The populations on the south shore would be closely watched throughout the draw down period. If desiccation and mortality is observed then water should be brought to the rootwad holes in buckets and poured into the holes to maintain humidity. Also lightly misting the soil could be applied to areas where continued drying is being observed. It is estimated that there are upwards of 60 rootwad holes with goblins gold. At least 20 holes would be maintained throughout the draw down to reduce impacts to this species.

Mitigation/Monitoring for Noxious Weeds
Follow standard contract provisions and Best Management Practices (BMP's) that require all machinery and vehicles to be pressure washed and free of weed seed before coming on to the

work site and before leaving the forest. Avoid working in infested areas as much as possible; this may be very difficult at times especially at the outlet into Lake Creek. Educate work crews as to the locations of reed canary grass and inform them how to reduce the spread of this weed. This responds to the 2002 Integrated Weed Management Strategy Forest Plan Amendment.

Monitor the lake after the project to detect any new invasive aquatic plants to ensure that if there are invading species, they can be quickly treated as required in the 2002 Integrated Weed Management Strategy.

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